

REMARKS

Independent Claims 1, 3, 13 and 19 have been amended to define the steel alloy as boron-free, a feature disclosed in paragraphs 11 and 12 of the specification. Paragraph 11 explains the composition range of elements of the steel alloy (C, Mn, P, S, Si, Cr, Ni, Cu, Mo and Al) and paragraph 12 states:

The balance of the composition is iron (Fe) and those impurities and tramp or trace elements that are inevitably included during the melting of a material charge from which the steel alloy may be ultimately produced.

From the foregoing, it is clear that the disclosed alloy additions in paragraph 11 are C, Mn, P, S, Si, Cr, Ni, Mo, Al and Fe and that any other element is not an intentionally added element. Because B is not an intended addition and paragraph 11 states that the balance of the composition can be Fe and impurities, it is clear that the specification provides support for the claimed feature of the alloy being a boron-free steel alloy.

Claims 1-20 stand rejected under 35 USC § 103 (a) over U.S. Patent No. 5,855,846 (Beguinet). The rejection is respectfully traversed for the following reasons.

Claim 1 recites plastic mold tooling formed of a hot rolled boron-free steel alloy plate which has been manufactured by hot rolling, hot leveling after the hot rolling, air cooling after the hot leveling until complete transformation of the microstructure occurs, and tempering after the air cooling to lower hardness of the plate to about 277 to about 311 BHN, the steel alloy comprising: about 0.6 percent to about 0.9 percent by weight manganese; a maximum of 0.02 percent by weight phosphorous; from about 0.25 percent to about 0.45 percent by weight silicon; a maximum of 0.2 percent by weight nickel; a maximum of 0.15 percent by weight copper and from about 0.015 percent to about 0.03 percent by weight aluminum.

The combinations of features recited in Claim 1 and in the claims dependent thereon are not disclosed or suggested by Beguinot.

Beguinot discloses a boron-containing low alloy steel used for manufacture of molds for plastics wherein the steel is cast into an ingot or slab which is rolled or forged, the semiproduct is subjected to a heat treatment of quenching and annealing to provide a martensitic or bainitic structure essentially free of ferrite, the annealing being performed above 550°C but below Ac1 (column 1, lines 5-8; column 3, line 5; column 4, lines 48 and 57; column 7, line 36 through column 8, line 2). Beguinot states that the steel "must contain" boron to obtain "quenchability" (column 4, lines 52-67) and that before the rolled or forged steel is employed for mold manufacture the steel is subjected to "quenching heat treatment" (column 7, lines 36-38). This means that boron is a required element in the steel of Beguinot and the steel must be subjected to a "quenching heat treatment" (heating to austenitic state followed by quenching) to obtain the desired ferrite-free microstructure. As such, Beguinot teaches away from the plastic mold tooling formed from a hot rolled boron-free steel alloy plate as recited in Claim 1 and in the claims dependent thereon

Claim 3 recites a hot rolled and tempered plastic mold tool formed of a boron-free steel alloy having hardness of from about 277 to about 311 BHN, the steel alloy comprising: about 0.6 percent to about 0.9 percent by weight manganese; a maximum of 0.02 percent by weight phosphorous; from about 0.25 percent to about 0.45 percent by weight silicon; a maximum of 0.2 percent by weight nickel; a maximum of 0.15 percent by weight copper and from about 0.015 percent to about 0.03 percent by weight aluminum. Claim 13 recites the same features but limits the steel to "consisting essentially of" the recited alloy constituents. The combinations of

features recited in Claims 3 and 13 and the claims dependent thereon are not disclosed or suggested by Beguinot

As explained above, Beguinot discloses a boron-containing low alloy steel used for manufacture of molds for plastics wherein the steel is cast into an ingot or slab which is rolled or forged, the semiproduct is subjected to a heat treatment of quenching and annealing to provide a martensitic or bainitic structure essentially free of ferrite, the annealing being performed above 550°C but below Ac1 (column 1, lines 5-8; column 3, line 5; column 4, lines 48 and 57; column 7, line 36 through column 8, line 2). Beguinot states that the steel "must contain" boron to obtain "quenchability" (column 4, lines 52-67). As such, Beguinot teaches away from the hot rolled and tempered plastic mold tool of a boron-free steel alloy as recited in Claims 3 and 13 and in the claims dependent thereon.

Claim 19 recites a process for manufacturing a hot rolled and tempered plastic mold tool from a boron-free tool steel alloy, the process comprising the steps of: shaping the tool steel alloy by hot rolling into a hot rolled plate using a hot rolling mill; hot leveling the hot rolled plate while the hot rolled plate is still on the hot rolling mill; cooling the hot leveled plate by free air cooling to a temperature below about 600 ° F.; tempering the air cooled plate to a hardness in the range of from about 277 to about 311 BHN and forming the tempered air cooled plate into plastic mold tooling. The claimed process provides cost savings over the Beguinot process wherein a boron-containing hot rolled steel must be subjected to a "quenching heat treatment" (heated into its austenitic state followed by quenching) to obtain the desired microstructure. The combinations of features recited in Claim 19 and in the claims dependent thereon are not disclosed or suggested by Beguinot.

Beguino does not disclose hot leveling nor is there any disclosure in Beguino of free air cooling a hot leveled plate, tempering the air cooled plate and forming the air cooled plate into a plastic mold tooling. Instead, Beguino states that the steel "must contain" boron to obtain "quenchability" (column 4, lines 52-67) and that before the rolled or forged steel is employed for mold manufacture the steel is subjected to "quenching heat treatment" (column 7, lines 36-38). As such, Beguino teaches away from the process recited in Claim 19 wherein a hot rolled and tempered plastic mold tool of a boron-free steel alloy is manufactured by hot rolling, hot leveling the hot rolled plate while it is still on the hot rolling mill, free air cooling the hot leveled plate, tempering the air cooled plate to a hardness of about 277 to about 311 BHN and forming the tempered air cooled plate into plastic mold tooling.

It is submitted that the differences between the claimed subject matter and the prior art are such that the claimed subject matter, as a whole, would not have been obvious at the time the invention was made to a person having ordinary skill in the art.

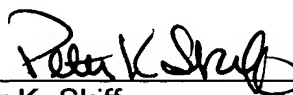
In view of the foregoing, it is submitted that the present application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

BUCHANAN INGERSOLL PC

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By: _____


Peter K. Skiff
Registration No. 31917

P.O. Box 1404
Alexandria, VA 22313-1404
703.836.6620